Office of the County Engineer
One Government Center – Suite 870
Toledo, Ohio 43604-2258
www.lucascountyoh.gov/engineer

Phone: 419-213-4540
FAX: 419-213-4438

Keith G. Earley, P.E., P.S.
County Engineer

ROUNDABOUT DESIGN DIRECTIVES AND GUIDELINES

(REVISION 10/11/2011)

1. **PURPOSE:**
This directive sets forth the Lucas County Engineer's guidelines for the design of roundabouts.

2. **SCOPE:**
These guidelines apply to the County highway system and to local roads where County funding is used. These also apply where State or Federal funds will be used. Roundabouts must be approved according to an Engineering Study and Approval by the County Engineer prior to beginning design.

3. **GUIDELINES:**
   A. General
      1) All movements should be accounted for in the design.
      2) A roundabout should be designed for current peak hour traffic at time of construction.
      3) The roundabout should be planned for a 20 year design life such that no right of way would have to be purchased to increase capacity once the roundabout is constructed.

   B. Operational
      1) If these guidelines are not followed, with a County/Village/City joint cooperation agreement, the agreement must state that if the roundabout fails within the first year then the County is not responsible for any construction or re-engineering costs.
      2) Driveways should not be allowed within the limits of the splitter island. (Exceptions are to be approved by the County Engineer.)

C. Geometry

1) All Roundabouts

a. All speed control shall take place prior to the yield point on entry. The recommended design speed for all vehicles entering the roundabout is 15 mph. Remove any reverse curvature between the entrance and exit radii and join with straight curb sections.

b. The offset left alignment is preferred, the center alignment and the offset right alignment requires a design exception to be approved by the County Engineer.

c. Approach legs should be designed as perpendicular to each other as possible.

d. Entry width should be 18' for a single lane roundabout unless a wider entry is needed due to a larger design vehicle. Entry widths for dual movements are to be designed using Auto TURN or similar design software.

e. Circulatory roadway width should accommodate buses and fire trucks. All other vehicles should have to use the truck apron.

f. Exit radius should be between 400' – 600'.

g. Use a WB-67 for the design vehicle. (Exceptions are to be approved by the County Engineer.)

h. Truck Aprons

1. Range from 3 ft to 13 ft wide with an approximate cross slope of 2 percent, and shall not exceed 3 percent away from the central island. Exact width of truck apron should be determined from Auto TURN or similar design software.

2. See Figure 1.1 for more detail.

i. Length of splitter island measured along the approach should be at least 50' long. Longer islands or extended raised medians should be used in areas with high approach speeds.

j. Straight vertical face curbs are required in the area of the splitter island on both sides of the roadway and on the splitter island. The approach nose of the splitter island should be tapered down to a sloped curve.

k. Straight vertical face curb should begin at the edge of the finished shoulder on the approach roadway, then taper inward using a shifting taper to the edge of the travel way. Continue the curb on the edge of the travel way through the roundabout entrance and along the outside diameter to the various exits.

2) Single Lane Roundabouts

a. The inscribed circle shall be at least 110' diameter.

b. The circulatory width shall be approximately 21', excluding the truck apron.

3) Multi-Lane Roundabouts
   a. The inscribed circle shall be at least 150' diameter, 175' diameter minimum preferred.
   b. Gore striping shall be used between entry lanes to keep 12' lane widths for passenger vehicles.
   c. If possible, design for a 1 lane exit.
   d. Outside lane can only exit while inside lane can exit or keep circulating.
   e. Path overlap
      1. Striping can not be used to mitigate path overlap.
      2. A diagram should be furnished illustrating that path overlap does not exist: Designers should determine the natural path overlap by assuming the vehicles stay within their lane up to the yield point. At the yield point the vehicle maintains its natural trajectory into the circulatory roadway. The vehicle will then continue into the circulatory roadway and exit with no sudden changes in curvatures or speed.

D. Pedestrians
   1) Stopping sight distance to the crosswalk shall be provided.
   2) The pedestrian crossing is to be located at least 25 feet from the yield line to the center of the crosswalk.
   3) Sidewalk, ramp and crosswalk shall meet current ADA and ODOT standards.

E. Bicycles
   1) End all shoulders and bike lanes at least 165' in advance of the yield line.
   2) Curb ramps should be placed where the shoulder/bike lane terminates to allow cyclists to access the mix use path / or dismount and use sidewalk.

F. Transit
   1) Bus pullouts shall not be located on the circulatory roadway.
   2) A bus stop is best situated:
      a. On an exit lane in a pull out just past the crosswalk.
      b. On an approach leg 60' upstream from the crosswalk, in a pullout.

G. Signing
   1) See Figures 1.4 and 1.5 for signing layouts.
   2) Junction assemblies should be placed in advance of a roundabout.

3) Confirmation assembles should be place no more than 500' beyond the intersection.

4) Signs placed in center island shall be 24" from bottom of sign to ground.

5) Fishhook arrows shall be used on signs.

H. Pavement Markings

1) See Figures 1.6, 1.7, 1.8, 1.9 for marking layout.

2) Single lane roundabouts do not need lane arrows or circulatory roadway pavement markings except for edge line markings.

3) Fishhook pavement markings shall be used. See Figure 1.10.

4) Bike lane markings are not permitted within the circulatory roadway.

5) No yield lines (shark teeth) shall be used.

I. Landscaping

1) It is the intent that the County Engineer not be responsible for the upkeep of the landscaping. A permit/agreement shall be sought to be signed with the local community and/or private organization to upkeep the landscaping.

2) Provide two conduits to the central island, 1 for water and 1 for electrical.

3) No hard wall, fountains or any object that would encourage pedestrians shall be allowed in the center island.

4) Select plantings to ensure adequate sight distance and to minimize maintenance for the life of the project.

5) Use a 6:1 slope or flatter on the central island.

6) Keep at least the outside 6' of central island clear.

7) Splitter islands must not contain trees, planters or light poles.

8) Do not obstruct the sight triangle.

9) Avoid landscaping within 50' in advance of the yield point.

10) Use low profile landscaping in the corner radii if a crosswalk is provided.

J. Illumination

1) Light standards at a minimum should be located in advance of the crosswalk. Make sure pedestrians are not "back lit".

2) See Chart below.

Recommended Illuminance for Intersections				
Roadway Classification (Street A/Street B)	Average Maintained Illuminance at Pavement[1]			Uniformity Ratio (Eavg/ Emin)[2]
	Pedestrian/Area Classification			
	High Lux (fc)	Medium Lux (fc)	Low Lux (fc)	
Major/Major	34.0 (3.2)	26.0 (2.4)	18.0 (1.7)	3.0
Major/Collector	29.0 (2.7)	22.0 (2.1)	15.0 (1.4)	3.0
Major/Local	26.0 (2.4)	20.0 (1.9)	13.0 (1.2)	3.0
Collector/Collector	24.0 (2.2)	18.0 (1.7)	12.0 (1.1)	4.0
Collector/Local	21.0 (2.0)	16.0 (1.5)	10.0 (0.9)	4.0
Local/Local	18.0 (1.7)	14.0 (1.3)	8.0 (0.7)	6.0

[1] fc=foot candles (conversion factor from lux to foot candles is 10.67
(fc has been rounded to the nearest tenth)

[2] Eavg = Horizontal Illuminance, Emin= Verticaql Illuminance
Source ANSI/IESNA RP-8-00 Table 9

Roadway Classification	**Description**	**Existing Daily Vehicular Traffic Volumes**
Major	That part of the roadway system that serves as the principal network for through traffic flow. The routes connect areas of principal traffic generation and important rural roadways leaving the city. Also often known as "arterials," "thoroughfares" or "preferential."	Over 3,500 ADT
Collector	Roadways servicing traffic between major and local street. These are street used mainly for traffic movements within residential, commercial, and industrial areas. They do not handle long, through trips.	1,500 to 3,500 ADT
Local	Local streets are used primarily for direct access to residential, commercial, industrial, or other abutting property.	100 to 1,500 ADT

Pedestrian Conflict Area Classification	Description	Guidance on Existing Pedestrian Traffic Volumes
High	Areas with significant numbers of pedestrians expected to be on the sidewalks or crossing the streets during darkness. Examples are downtown retail areas, near theaters, concert halls, stadiums and transit terminals.	Over 100 pedestrians/hour
Medium	Areas where lesser numbers of pedestrians use the streets at night. Typical are downtown office areas blocks with libraries, apartments, neighborhood shopping, industrial, older city areas, and streets with transit lines.	11 to 100 pedestrians/hour
Low	Areas with very low volumes of night pedestrian usage. These can occur in any of the cited roadway classifications but may be typified by suburban single-family streets, very low-density residential developments and rural or semi-rural areas.	10 or fewer pedestrians/hour

Notes:
1) Existing Daily Vehicular Traffic Volumes are for purposes of intersection lighting levels only

2) Pedestrian volumes during the average annual first hour of darkness (typically 6:00 pm – 7:00 pm) representing the total number of pedestrians walking on both sides of the street plus those crossing the street at non-intersection locations in a typical block or 656 ft section. These volumes are for purposes of intersection lighting levels only and should not be construed as a warrant.

4. **APPLICATION OF STANDARDS:**
These standards shall apply immediately to all new installations. The existing locations shall be brought into conformance with this policy as time permits.

5. **OTHER ISSUANCES AFFECTED:**
All directives, memoranda or instructions issued heretofore in conflict with this directive are hereby rescinded.

6. **IMPLEMENTATION:**
This directive will become effective immediately upon issuance.

Keith Earley

Keith G. Earley, PE, PS
Lucas County Engineer

Figure 1.1 Central Island Cross-Section

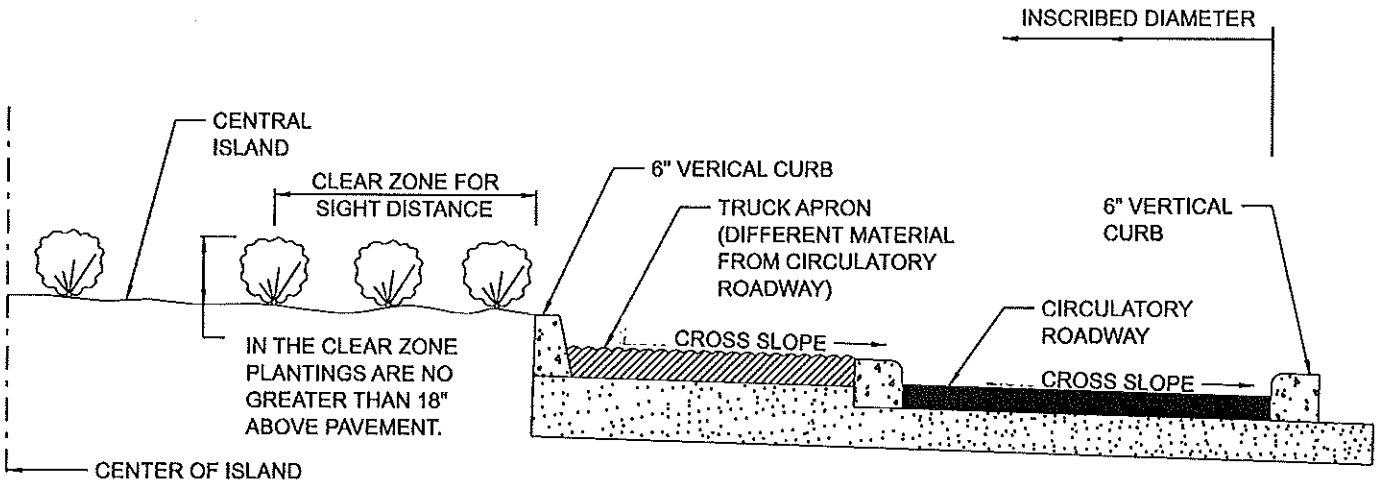


Figure 1.2 Roundabout Alignment

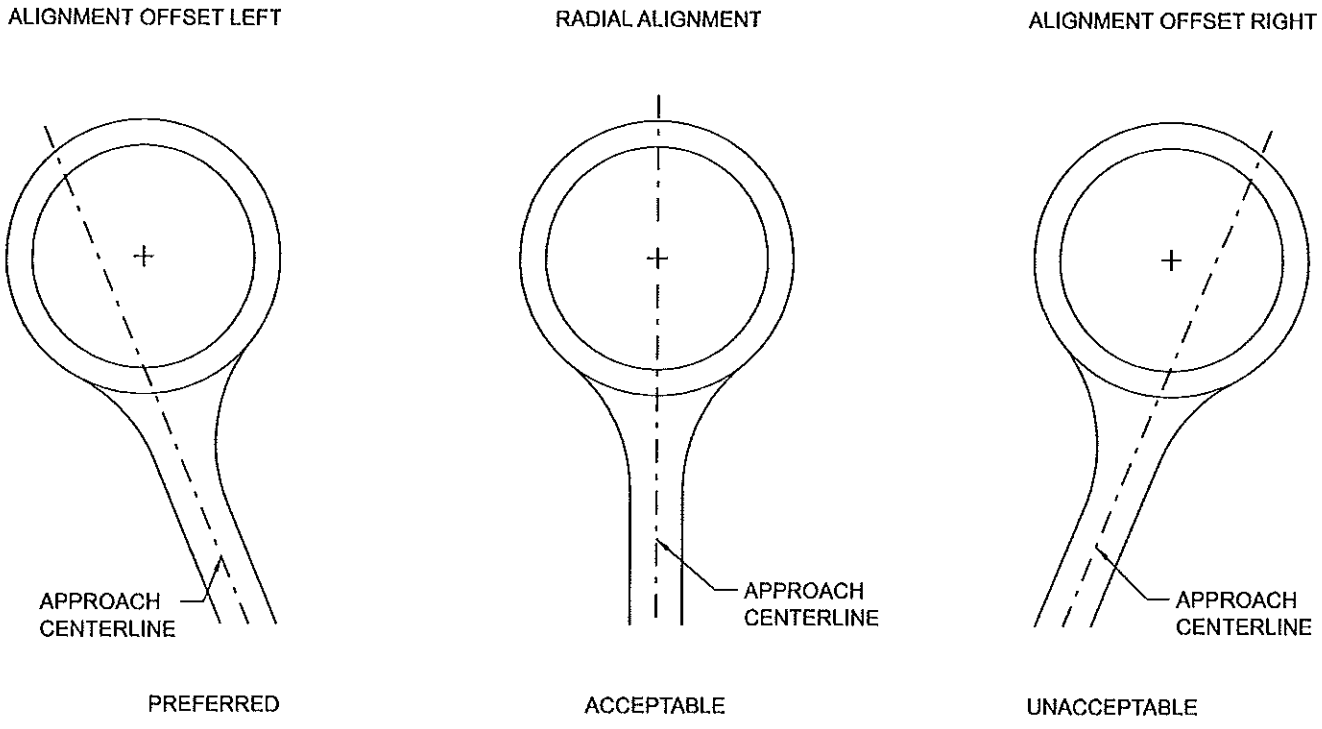


Figure 1.3 Roundabout Parts

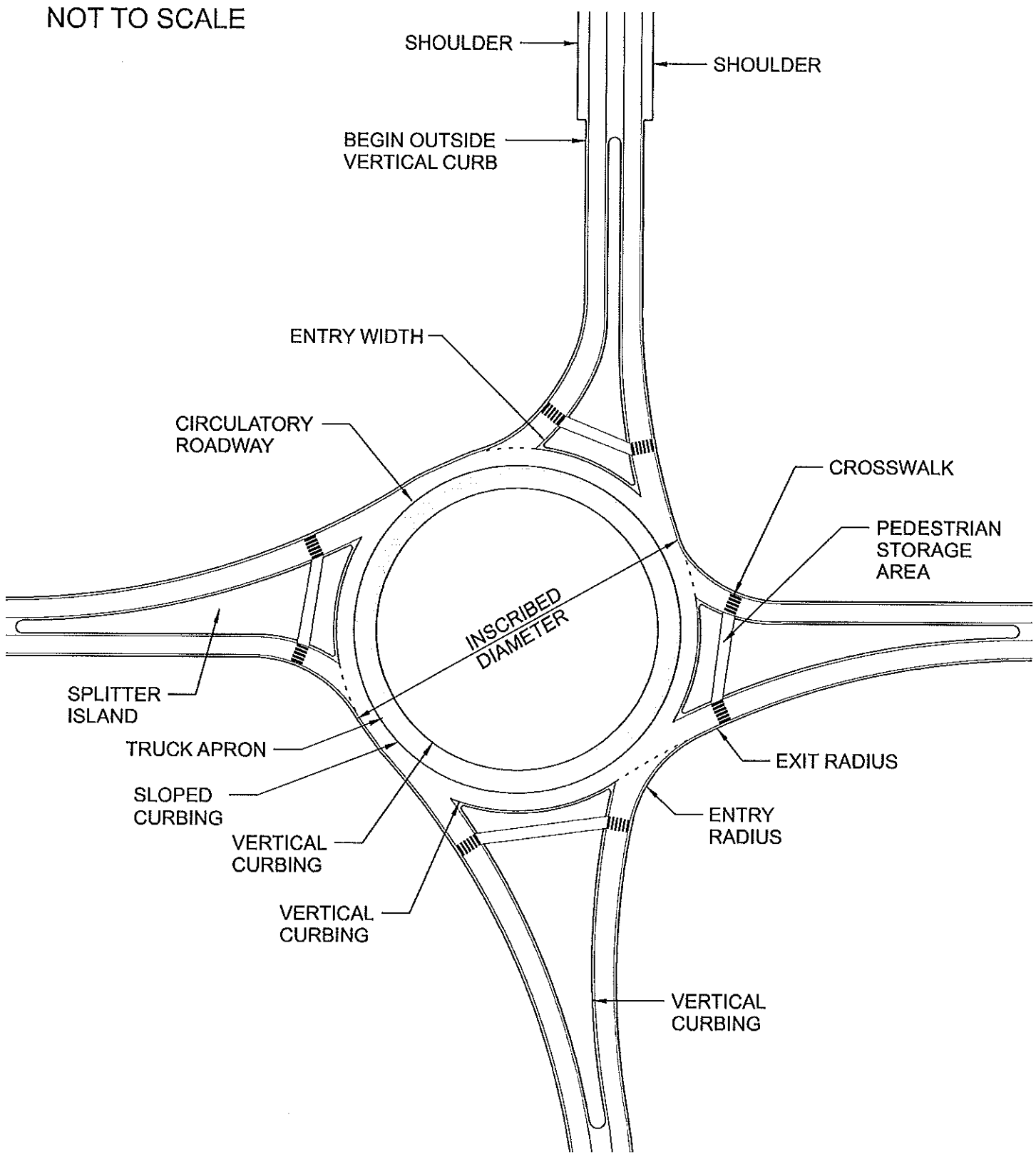
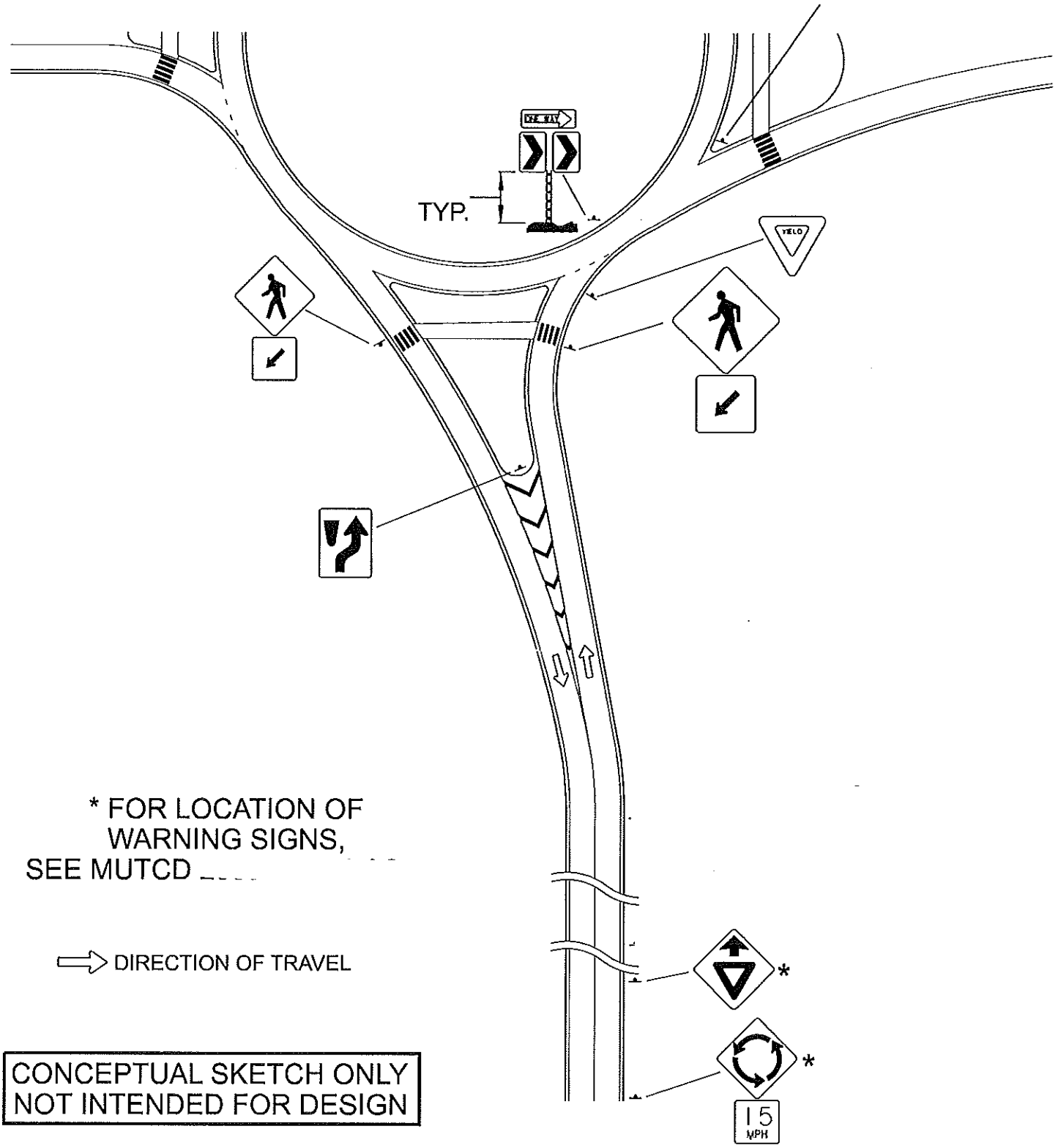


Figure 1.4 Single Lane Roundabout Signing

NOT TO SCALE



* FOR LOCATION OF WARNING SIGNS, SEE MUTCD

DIRECTION OF TRAVEL

CONCEPTUAL SKETCH ONLY
NOT INTENDED FOR DESIGN

Figure 1.5 Multilane Roundabout Signing

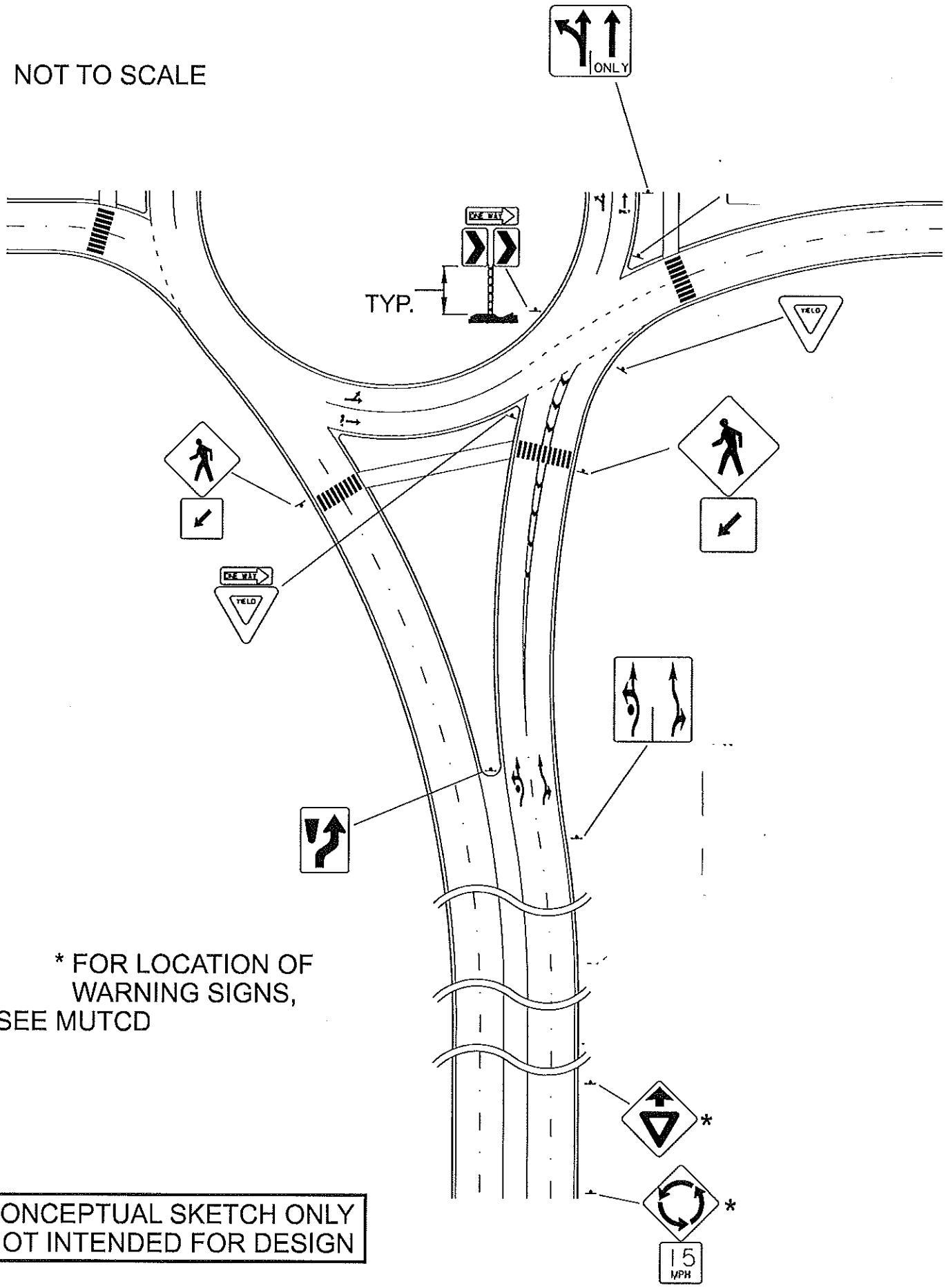
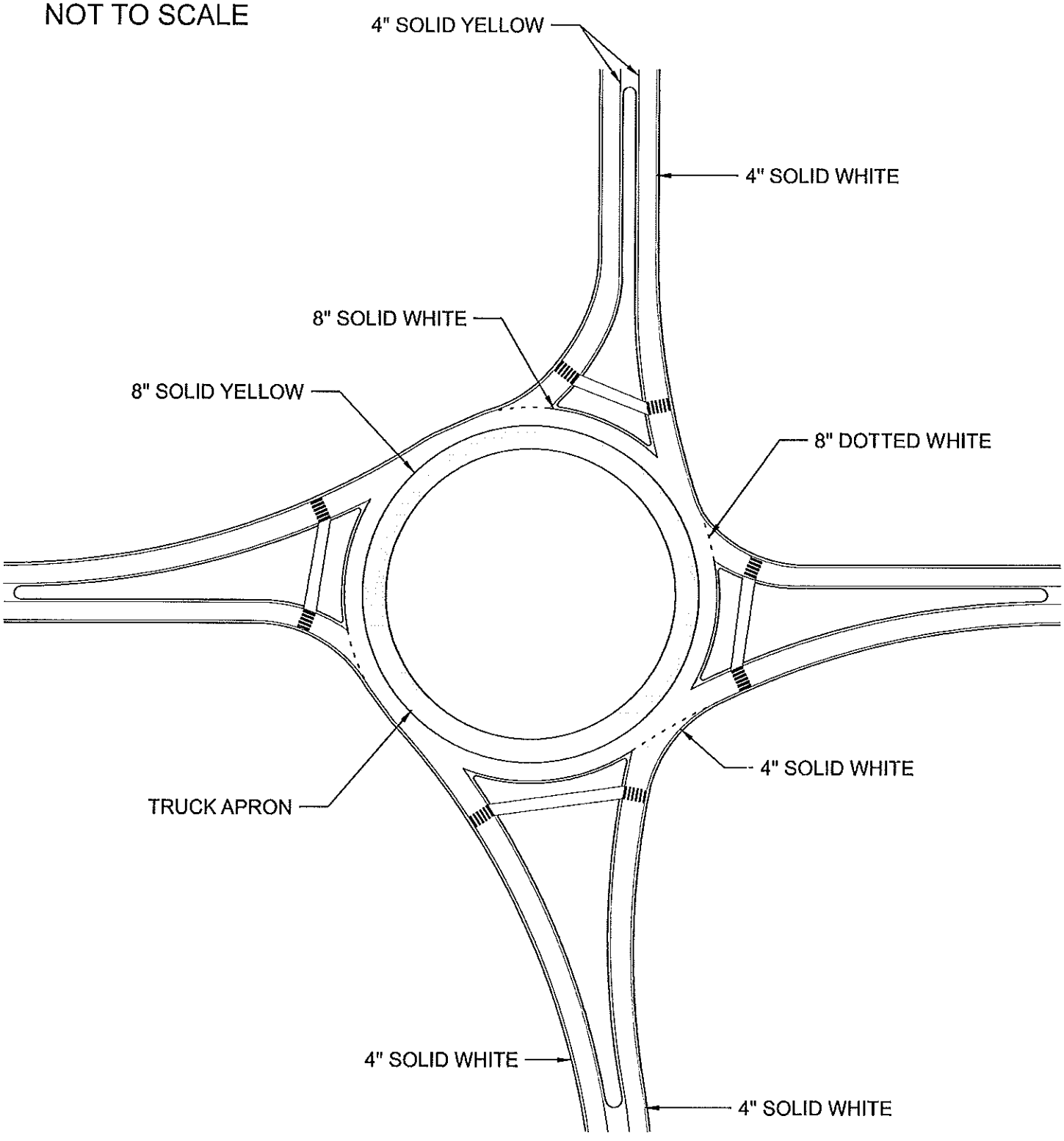


Figure 1.6 One-Lane Roundabout Markings

NOT TO SCALE

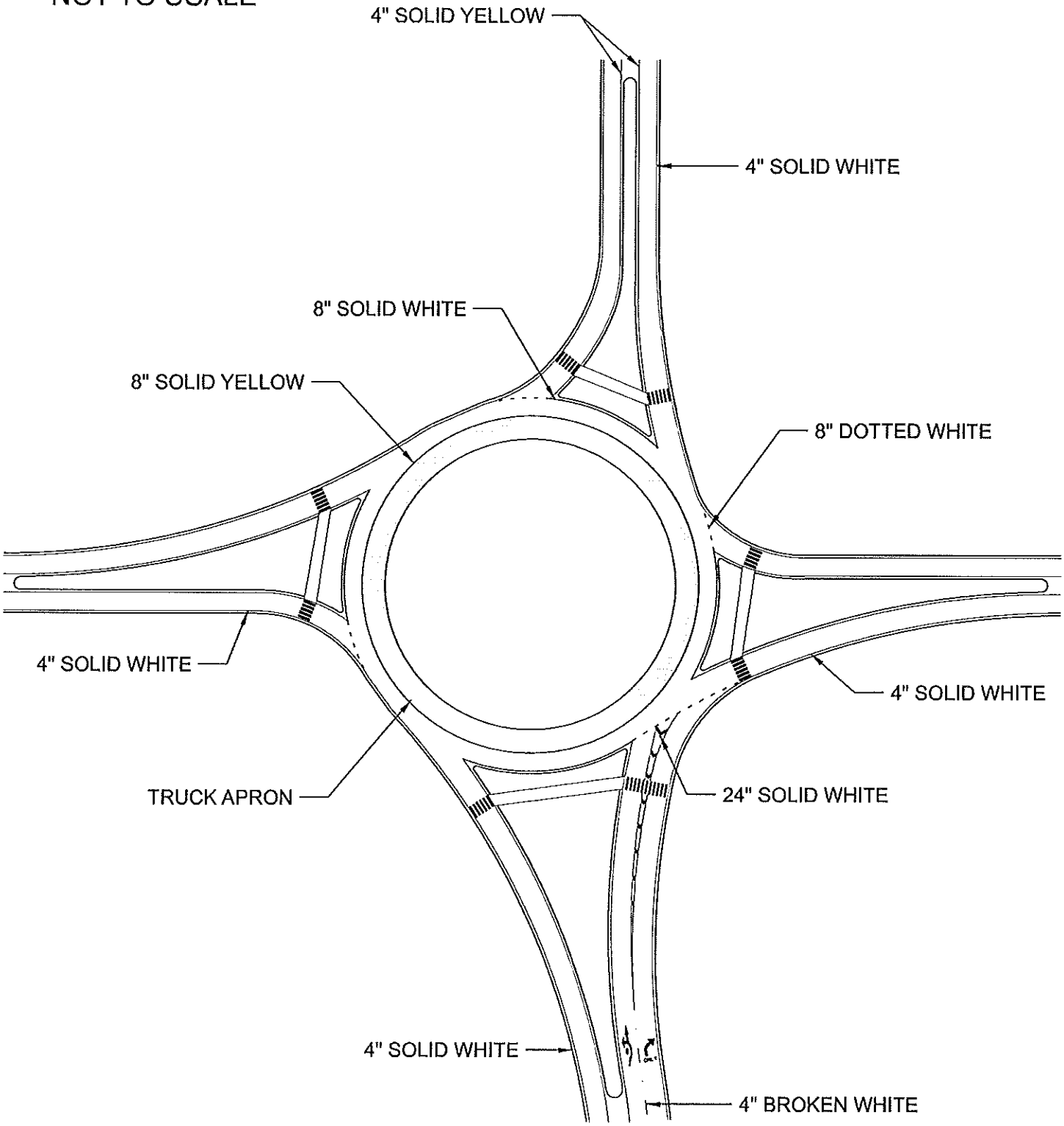


CONCEPTUAL SKETCH ONLY
NOT INTENDED FOR DESIGN

NO ARROW PAVEMENT MARKINGS ARE TO BE USED ON SINGLE LANE APPROACHES

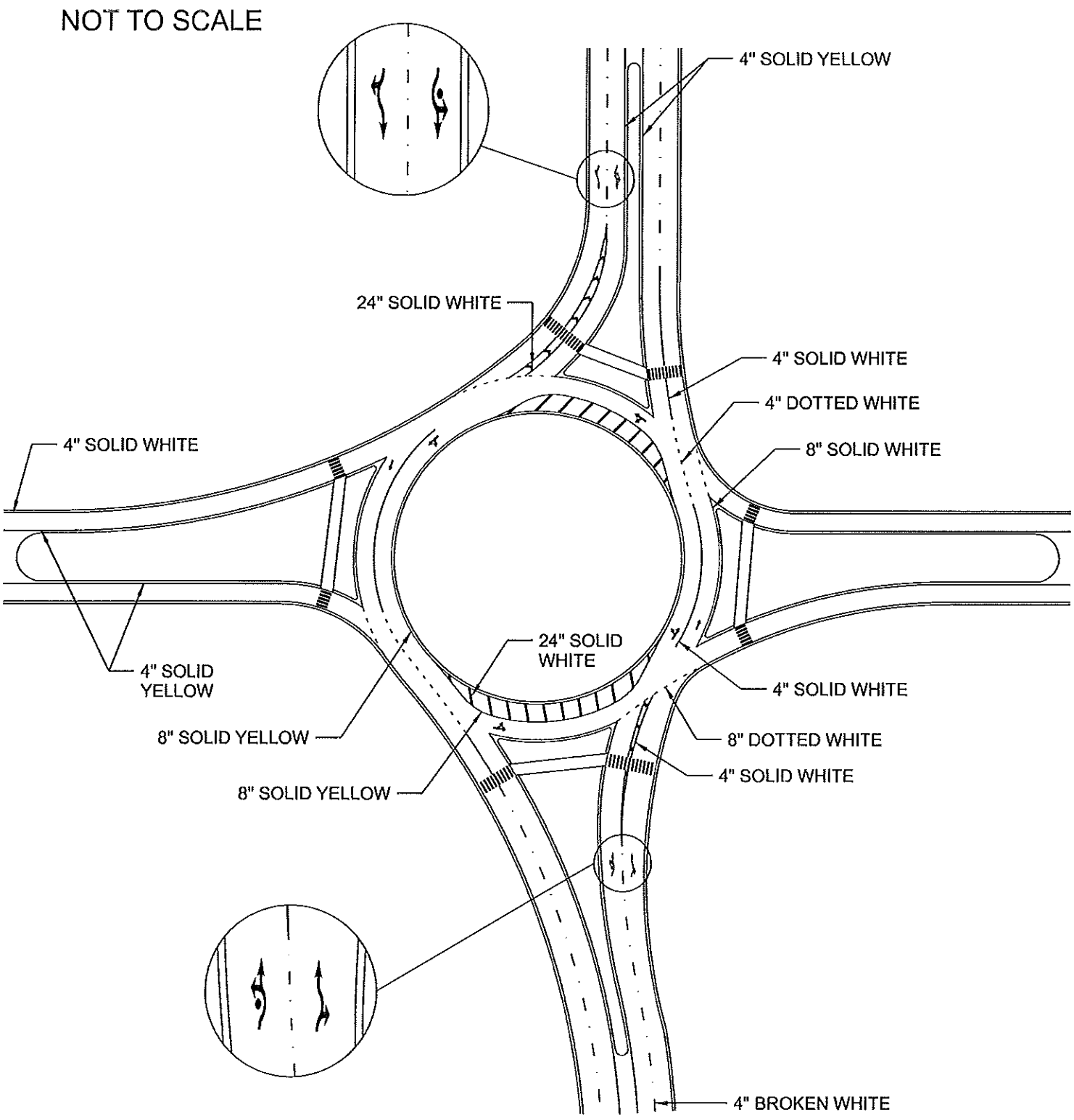
Figure 1.7 One-Lane Roundabout with Dedicated Right Turn Lane

NOT TO SCALE



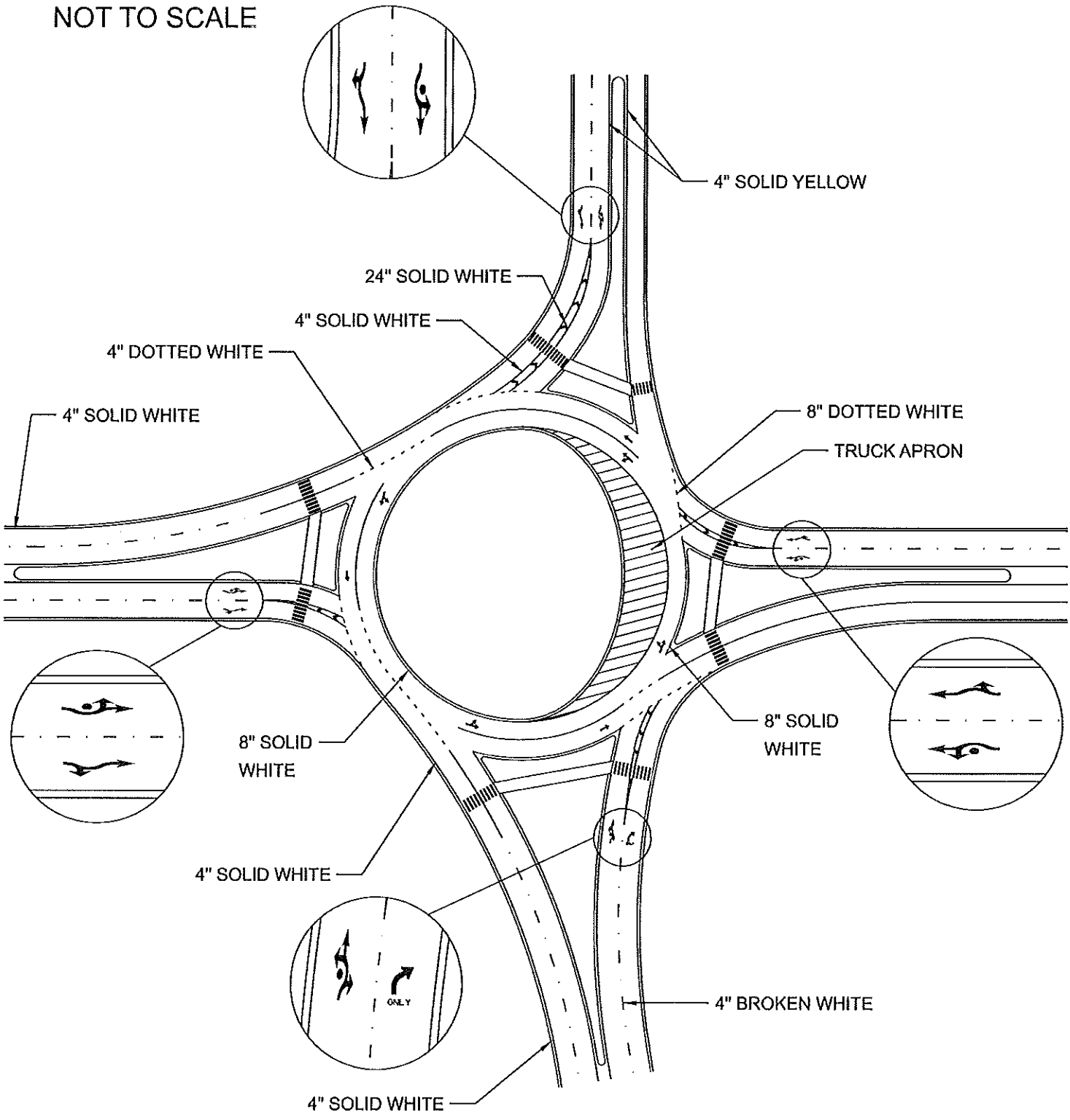
CONCEPTUAL SKETCH ONLY
NOT INTENDED FOR DESIGN

Figure 1.8 (Pavement Markings) Two-Lane Roundabout with One- and Two-Lane Approaches



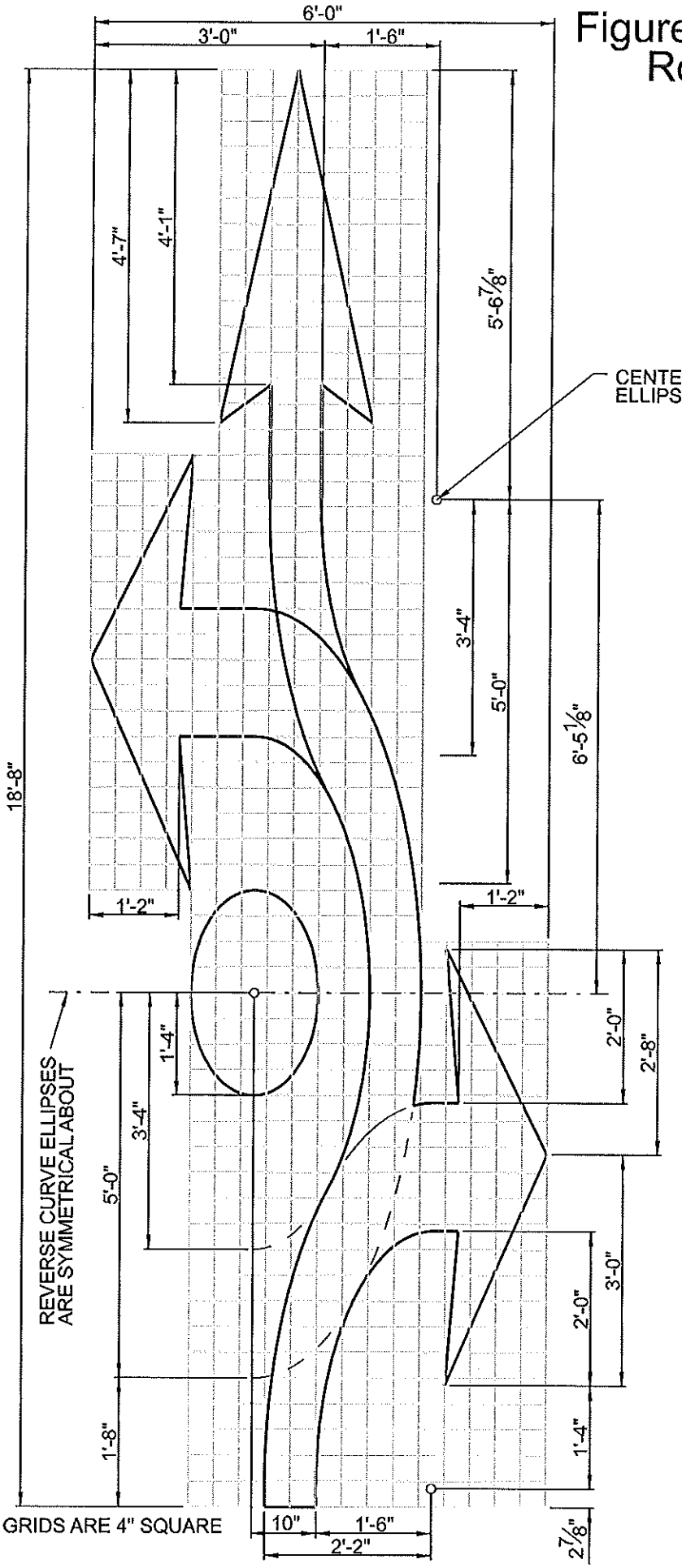
CONCEPTUAL SKETCH ONLY
NOT INTENDED FOR DESIGN

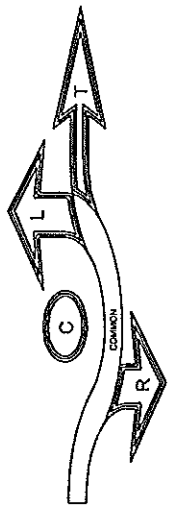
Figure 1.9 (Pavement Markings) Two-Lane Roundabout with Double Right Turn Lanes



CONCEPTUAL SKETCH ONLY
NOT INTENDED FOR DESIGN

Figure 1.10 (Pavement Markings) Roundabout Arrow Details





COMPONENT KEY

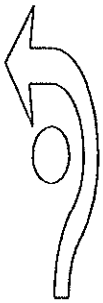
THE LABELED AREAS ABOVE CORRESPOND TO THE PORTIONS NEEDED FOR EACH TYPE OF ROUNDABOUT TRAFFIC ARROW.

*"C" SHOULD ONLY BE USED IN THE INSIDE LANE.

TYPE LTRC
28.70 SQ. FT.

TYPE LTC
24.19 SQ. FT.

TYPE TRC
23.07 SQ. FT.



TYPE LC
18.07 SQ. FT.

ASSUME POINTS NOT DIMENSIONED TO BE COINCIDENT WITH GRID LINES

Figure 1.11 Crosswalk Details